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September 19, 2017

BY ECFS

Marlene Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: **Elefante Group *Ex Parte* Presentation, IB Docket No. 16-408**

Dear Ms. Dortch:

Elefante Group, Inc. ("Elefante Group") files this letter to address several elements of the Commission's rulemaking proceedings considering technical and operational rules applicable to future non-geostationary-orbit ("NGSO") fixed-satellite service ("FSS") constellations.[1]

As detailed in a recent *ex parte* notice submission filed in this and other Commission proceedings, Elefante Group aspires to be the world leader in persistent stratospheric-based communications infrastructure.[2] Drawing closely on Lockheed Martin Corporation's long-acknowledged expertise and experience with lighter-than-air platforms and communications systems, the Elefante Group airship platforms and communications payloads will support high-density, high-frequency re-use terrestrial broadband communications and Internet of Things ("IoT")-enabling solutions for the communications, government, institutional, and enterprise sectors.[3] Elefante Group and Lockheed Martin continue to refine their innovative design which

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1 *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, IB Docket No. 16-408, Notice of Proposed Rulemaking, FCC 16-170, 31 FCC Rcd 13651 (2016) ("NGSO NPRM").

2 Letter from Edward A. Yorkgitis, Jr., Kelley, Drye, & Warren, LLP, Counsel for Elefante Group, to Marlene S. Dortch, Secretary, Federal Communications Commission, GN Docket Nos. 17-183, 14-177, IB Docket Nos. 17-95, 15-256, 97-95, 16-408, RM-11-664, and WT Docket No. 10-112 (filed Sep. 8, 2017) ("*September 8 Letter*").

3 Elefante Group plans to deploy platform-enabled solutions that will make possible high-speed broadband connectivity to residences and businesses, ultra-high capacity broadband connectivity to establish secure private lines and networks for enterprises, wireless carrier

possesses exceptional flexibility and yields superior capacity while maximizing spectrum efficiency and frequency band utilization by a variety of users. Elefante Group and Lockheed Martin have been designing for spectral efficiency and compatibility from the outset relying on advanced waveforms and antennas – which will generate a high degree of frequency reuse within an operating radius of up to 70 kilometers.[4] To complement its design efforts and ongoing spectrum compatibility studies, Elefante Group, supported by Lockheed Martin, plans to engage with incumbent and future users to further refine spectrum compatibility solutions, including in bands in which future NGSO systems are being planned.

Elefante Group is targeting full commercial operations in the United States through deployment of payloads on stratospheric airborne platforms operating below 20 km as Fixed Services connecting the platforms with user terminals, primarily in select bands between 17.8 and 24.0 GHz.[5] As explained in the *September 8 Letter*, the ongoing analysis and modeling and design efforts of Elefante Group and Lockheed Martin may indicate the need to supplement use of the 17.8-24.0 GHz bands with spectrum from other frequency bands in order to meet Elefante Group's platform-level performance requirements. Elefante Group is innovating to use encumbered bands in a spectrally compatible manner with existing licensees taking into account

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backhaul for connecting small cells to network infrastructure to meet network densification needs of 5G, and IoT-enabling applications combining sensing and communications capabilities. Elefante Group's platform-enabled solutions will advance the achievement of numerous high-priority objectives of the Commission, including private investment in high speed broadband infrastructure, closing the digital divide, densification and deployment of 4G, 5G, and IoT-enabling technologies, maximization of spectrum efficiency and band utilization, forward-looking spectrum sharing, rapid deployment/restoration of communications capabilities enhancing public safety and disaster relief, and the creation of tens of thousands of American jobs in areas such as engineering, construction, and operations. *See September 8 Letter* at 2-4**.**

[4] Elefante Group, supported by Lockheed Martin, is designing communications payloads to reuse each channel in a cellular pattern of spot beams, each only a few kilometers in diameter, as many as 180-to-200 times within the footprint of each platform. The payloads will thus achieve approximately 500 bps/Hz on an aggregate basis across a single platform's service area. *Id.* at 5 n. 8 and Attachment at 9. Spectrum compatibility with incumbent uses will be achieved in large part because of the high-altitude platform geometry, creating directional and spatial diversity relative to incumbent and future applied-for uses, and the small size of the platform's beams which enables considerable flexibility in beam lay-down patterns and a high level of frequency reuse. *See id.* at 5, n.7, and 8 n.14. Elefante Group and Lockheed Martin will rely upon the application of other mitigation methods to enhance compatibility. Elefante Group looks forward to engaging with incumbent and future users on these matters.

[5] Feeder links and cross links, i.e., inter-platform links, will meet other requirements of the Elefante Group platforms and network in different bands – such as the 71-76 and 81-86 GHz bands for feeder links and free space optical paths or other higher frequency bands for cross links.

initiatives in existing Commission proceedings that may affect allocations and access to these bands, including this *NGSO Rulemaking*. Elefante Group's system requirements to meet projected demands are a total throughput of 1 Tbps per platform for communications between the platform and user terminals at the time of launch of commercial operations with future growth in capacity planned leveraging a variety of methods. Based on significant analysis to date and present understandings of Elefante Group and Lockheed Martin about achievable spectrum compatibility in the bands they have been examining, each airship platform will require, in an ideal deployment, use of at least 1.25 gigahertz of spectrum in each direction for both platform-to-user and user-to-platform communications.

The Commission, in the *NGSO NPRM* raises the important issue of sharing between NGSO FSS systems and non-satellite technologies and platforms.[6] A critical scenario is co-band sharing between airborne platforms and NGSOs. Lockheed Martin, in its comments in this proceeding, explained that it was undertaking study of that exact scenario.[7] In connection with Elefante Group, those studies have matured further with the objective of achieving deployment of platforms within the next several years at the same time or even in advance of most, if not almost all, future NGSO constellations.

As explained in the *September 8 Letter*, Elefante Group, supported by Lockheed Martin, is principally focusing on use of the 22.0-24.0 GHz range to support platform-to-user terminal downlinks.[8] A key source for supplemental (or growth) spectrum to achieve performance requirements complementary, or as an alternative, to the 22.0-24.0 GHz range would be the current co-primary FIXED allocations in the 28.35-29.10 and 29.25-29.50 GHz bands. As Lockheed Martin observed in its comments, "the potential for co-primary use of these bands by airborne platforms under the sharing scenario described generally in these comments should be preserved, which would require the Fixed Service allocation to remain, at least for this limited type of operation."[9] Elefante Group naturally wholeheartedly endorses the position that the FIXED allocations in these bands should be preserved – at least for stratospheric airborne platform systems operating at nominally fixed positions – to promote the potential for innovative spectrum sharing in these bands to achieve maximum utilization of the bands.[10] This is

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6 *NGSO NPRM* at ¶ 17.

7 Comments of Lockheed Martin Corporation, IB Docket No. 16-408, at 8-10 (filed Feb. 27, 2017) ("Lockheed Comments").

8 *See September 8 Letter* at 7 and Attachment at 10-11.

9 Lockheed Comments at 10.

10 At the time the Commission adopted is Ka-Band plan a number of years ago, the basis for the *NGSO NPRM´*s proposal to remove the Fixed allocations in these bands, the potential use of the 28.35-29.1 and 29.25-29.50 GHz bands, had not been raised. A number of technological

particularly the case given the extremely high spectrum utilization relative to NGSO systems that Elefante Group platforms will be able to achieve at the launch of commercial service, approximately 500 bps/Hz within a platform's footprint with the capability to serve rural areas and help close the Digital Divide. Further, as detailed in the *September 8 Letter*, multiple co-frequency platforms, whether of one or several operators, can serve the same area using the same spectrum resources, enhancing the relative spectrum efficiency of airborne platforms even further.[11]

Elefante Group submits that the Commission should seize the opportunity to implement a regulatory framework in which airborne platform systems can operate compatibly with each other and other types of users in the same bands, especially as it moves to put in place technical and operational rules in a considerable number of bands in the millimeter wavelengths. In the same spirit that the agency has just launched its *Mid-Band Spectrum Notice of Inquiry*, in which Elefante Group intends to participate, seeking ways in which additional broadband opportunities can be created in bands below 24 GHz, the Commission has the opportunity *now* to ensure maximum flexible use is made of certain spectrum above 24 GHz to meet the broadband and advanced communications needs of the future.[12] The frameworks that the Commission implements should support the compatible deployment and operation of multiple communications platforms – ground-based, airborne, and satellite – within the same bands where technically feasible. As the Satellite Industry Association explained in the *Spectrum Frontiers* proceeding, "[t]o achieve the full promise of a 5G future, the Commission's plan for these bands must accommodate the needs of satellite, maritime and airborne platform, and terrestrial wireless operators, which can be accomplished through reasonable and equitable sharing approaches . . .."[13] Elefante Group concurs, and is concerned that the elimination of the FIXED allocation in

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developments in the intervening years in stratospheric platform design and communications radio systems now make the persistent use of these bands by airborne platforms much more feasible and cost effective and will allow such platform systems to serve a wider variety of uses and at much higher capacities than previously envisioned.

11 *September 8 Letter* at 8-9 and Attachment at 17-18**.**

12 *See Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183, Notice of Inquiry, FCC 17-104 (Aug. 3, 2017).

13 Reply Comments of the Satellite Industry Association on the Spectrum Frontiers Further Notice of Proposed Rulemaking, GN Docket No. 14-177, at 7 (filed Oct. 31, 2016). *Accord* Comments of Lockheed Martin Corporation on the Spectrum Frontiers Further Notice of Proposed Rulemaking, GN Docket No. 14-177, at 13 (filed Sept. 30, 2016) ("Lockheed Martin encourages the Commission to rethink its current preference for rigid measures designed to advance the competitive interests of terrestrial mobile broadband, and re-center its focus on a broader public interest – which, in this area, requires flexible and adjustable arrangements that maximize both the efficient use of the spectrum and the prospects that those technologies prepared to adapt and innovate will be the ones that the markets may consider").

the 28.35-29.1 and 29.25-29.50 GHz bands, at least with regard to airborne platform uses operating in the Fixed Services, would set back the potential for achieving that promise in the Ka-bands.

Elefante Group suggests that, rather than delete the Fixed Services allocations, it would be prudent to preserve the Fixed allocations, at least with respect to stratospheric airborne platform systems operating at nominally fixed positions, and decide whether to retain them after a full record is developed on co-band sharing considerations between NGSO operations and such airborne platform systems, at which time Fixed Services rules could be implemented for such systems, as appropriate. The Commission should consider augmenting the Further Notice of Proposed Rulemaking proposed in the *Draft Order* in this docket issued to the public on September 7, 2017,[14] and specifically seek comment on sharing between FSS and stratospheric airborne platforms operating as Fixed Services in the 28.35-29.1 and 29.25-29.50 GHz, as well as other, bands.[15] Proceeding in this manner would not impede the actions the Commission otherwise chooses to take in these bands to enable NGSO deployment and utilization of these bands. Further, the *Draft Order* suggests that the Commission "agrees this issue warrants further consideration."[16]

To promote sharing in these bands between NGSO systems and airborne platforms, the Commission should consider two other matters raised in the *NGSO NPRM*. **First,** the existence of earth station power limits, including off-axis power limits, would help create a predictable environment in the spectrum that NGSO systems occupy and promote sharing and maximum utilization of the bands. Such limits, which could be the result, for example, of industry

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[14] *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, IB Docket No. 16-408, FCC-CIRC1709-04 (draft issued Sep. 7, 2017) ("*Draft Order*").

[15] It would be administratively inefficient for the Commission to eliminate the co-primary Fixed allocations in these bands now and later to consider reinstating Fixed allocations once Elefante Group and Lockheed Martin complete their ongoing compatibility studies. (Elefante Group notes that currently there are no Fixed services rules to support these allocations – so there is no immediate likelihood of Fixed station applications and deployments apart from a very small number of licenses that appear in the FCC's database in these bands.)

[16] *Id.* at ¶ 30. While some administrations may be studying the compatibility of high altitude platform stations ("HAPS") in bands that have been designated or may be designated at the World Radiocommunication Conference in 2019, as the *Draft Order* observes (*id.*), the stratospheric platforms that Elefante Group plans to deploy in the United States to provide the wholesale services described herein and in the *September 8 Letter* will operate below 20 km and, accordingly, will not, by definition, be HAPS. Non-HAPS platforms will not be covered by these studies.

collaboration or, alternatively, Commission action, could take several forms, such as default limits that could be exceeded provided that the operator seeking to exceed them has successfully coordinated with other users that are both authorized and operating in the same frequency band.[17] Earth station antenna gain standards would minimize adverse impacts to overall spectral utilization resulting from off-axis earth station emissions without compromising the functionality of the earth stations. A number of parties comment favorably in the record on the implementation of earth station power limits.[18] As Lockheed Martin notes, "[t]he fixing of [off-axis effective isotropic radiated power ("EIRP")] limits will allow a reduction in the required angular separation between co-frequency non-GSO FSS space station operations, and thus should facilitate sharing and technology neutrality, and preserve opportunities for later system entry."[19]

In addition to fostering maximum use of the bands by multiple NGSO system operators, as advocated previously by Lockheed Martin and other commenters, Elefante Group notes that earth station off-axis limits would allow user terminals receiving airborne platform transmissions (i.e., downlinks) to be situated relative to earth stations communicating with NGSO space stations in a way that maximizes spectrum utilization. Furthermore, in the absence of NGSO earth station power limits, Elefante Group is concerned that it will be more difficult for it and Lockheed Martin to conclude compatibility analyses between NGSO uplinks and Elefante Group platform downlinks.[20] While Elefante Group plans to engage in active dialogue with parties implementing and intending to implement NGSO systems to develop and further mutually refine acceptable compatibility solutions, without default power limits it will be challenging to develop baseline sharing considerations between NGSO earth stations and airborne platform user terminals because of the difficulties in determining the power directed along a horizontal ground path to Elefante Group user terminals.[21] Thus, if power limits are implemented, Elefante Group,

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17 *See NGSO NPRM* at ¶¶ 28-30.

18 *See, e.g.,* Comments of LeoSat MA, Inc., IB Docket No. 16-408, at 14-15 (filed Feb. 27, 2017); Lockheed Comments at 4-5; Comments of SES S.A. and O3b Limited, IB Docket No. 16-408, at 27-28 (filed Feb. 27, 2017); and Comments of Space Norway AS, IB Docket No. 16-408, at 13 (filed Feb. 27, 2017).

19 Lockheed Comments at 4.

20 Further, in the absence of published earth station receiver characteristics, the existence of transmit off-axis power limits would aid Elefante Group and Lockheed Martin in conducting compatibility analyses in the bands between 17.8-20.2 GHz and in considering how Elefante Group might deploy its airborne platform systems in a manner that maximizes spectrum utilization and achieves a high-degree of spectrum compatibility.

21 Elefante Group supports Lockheed Martin's proposal for minimum elevation angles for NGSO communications paths so as to further enhance spectrum compatibility with other emerging platforms and to limit the potential for interference as that which arises from off-axis

supported by Lockheed Martin, would be better able to determine how user terminals could operate compatibly[22] and, more importantly, to implement such compatible operations in practice.

In the event the Commission chooses not to adopt earth station off-axis emissions limits, Elefante Group still intends to move forward with discussions regarding the conditions for compatible operation with incumbent users in the 17.8-20.2 and 28.35-29.1 GHz bands, among others. The Commission should encourage NGSO operators to deploy their systems in a way that enhances spectrum compatibility and to make available information, with appropriate safeguards, as needed, to enable others to operate in a compatible manner within the same frequency bands.

Second, Elefante Group supports the Commission's proposal to make NGSO system ephemeris data available.[23] Not only is such information an essential element for spectrum sharing among NGSO FSS systems, it would be equally indispensable for non-satellite systems seeking to operate compatibly with NGSO systems. The studies that Elefante Group and Lockheed Martin are undertaking underscore this need. Indeed, as Lockheed Martin noted in its comments, were airborne platform system communications links to operate in the same direction as FSS communications links – one of the scenarios which Elefante Group and Lockheed Martin are examining – there will be potential in-line event interference issues for both the uplink and downlink paths: "The regulatory solution would be to ensure the availability of detailed non-GSO ephemeris data that is regularly updated – this would allow inline events to be addressed, while facilitating dynamic sharing . . .."[24] Accordingly, not only should the NGSO ephemeris

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emissions. *See, id.*, at 9 (Lockheed Martin states that "the Commission should consider requiring that non-GSO terminals operate at a high elevation angle (bidirectional) and airborne platform ground terminals operate at a minimum 15 degree elevation angle (bi-directional)").

[22] As Lockheed Martin noted in its comments in this proceeding, where NGSO earth station downlinks operate in the opposite direction from transmissions from airborne platforms to use terminals, a consideration for compatibility will be the horizontal distance between earth stations and user terminals. *Id.* at 9-10. While there may be EPFD rules for NGSO earth stations to address potential interference from uplinks to geostationary orbit ("GSO") systems, these do not assist in determining the power transmitting along a ground path from the earth stations.

[23] *See NGSO NPRM* at ¶ 24.

[24] Lockheed Comments at 8-9. Lockheed Martin goes on to state that "different from a non-GSO system that will have multiple and redundant link paths to users, ground communication links with airborne platforms will typically communicate with only a single in-view platform (much as a fixed user terminal communicates with a specific fixed base station or other fixed user terminal). As a result, a spectrum sharing mechanism accommodating when there are in-line events between airborne platforms and non-GSO satellites would be required to permit greater use of the bands that non-GSO FSS and fixed services both occupy." *Id.* at 9.

data be available to all authorized, co-frequency satellite operators, but the Commission should ensure that the NGSO operators have a duty to make them available to other users as well, such as authorized, co-frequency airborne platform operators.[25]

Elefante Group appreciates the opportunity to file these statements of its position in support of an NGSO framework that promotes spectral efficiency and spectrum compatibility not only among NGSO and other FSS systems, but also on a technology neutral basis between NGSO systems, airborne platforms, and other users. Elefante Group looks forward to the opportunity to engage further on these issues, to provide additional detail as its studies being conducted with Lockheed Martin progress and reach their conclusion, and to engage with NGSO operators and other incumbents, as well as future users, in the bands in which it is targeting for its stratospheric operations.

[25] Elefante Group would be satisfied in using the same system by which satellite operators will access such data, whether Commission-imposed or one that is mutually acceptable to satellite operators.

This letter is being filed pursuant to the requirements in Section 1.1206(b) of the Commission's rules.

Respectfully submitted,

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